Agilent 75000 Series B

Agilent E1364A
16-Channel Form C Switch Module

Service Manual

Serial Numbers

This manual applies directly to instruments with serial numbers prefixed with 2934A and higher.

Agilent Technologies

Copyright © Agilent Technologies, Inc. 1991-2005

E1364-90012
E012

Manual Part Number: E1364–90012

Printed September 2012 Edition 0912
Printed in U.S.A.

Contents

Warranty . . . 5
WARNINGS . . . 6
Safety Symbols . . . 6
Declaration of Conformity . . . 7
Reader Comment Sheet . . . 9

Chapter 1. General Information . . . 11

Introduction . . . 11
Safety Considerations . . . 12
WARNINGS and CAUTIONS . . . 12
Inspection/Shipping . . . 14
Initial Inspection . . . 14
Shipping Guidelines . . . 15
Environment . . . 16
Switch Description . . . 16
Switch Specifications . . . 16
Switch Serial Numbers . . . 16
Switch Options . . . 16
Recommended Test Equipment . . . 17

Chapter 2. Verification Tests . . . 19

Introduction . . . 19
Test Conditions and Procedures . . . 19
Performance Test Record . . . 19
Verification Test Examples . . . 19
Functional Verification . . . 20
Procedure . . . 20
Example . . . 20
Operation Verification . . . 20
Performance Verification . . . 21
Test Fixture . . . 21
Performance Test Record . . . 33
Switch Accuracy . . . 33
Measurement Uncertainty . . . 33
Test Accuracy Ratio (TAR) . . . 33

Chapter 3. Replaceable Parts . . . 39

Introduction . . . 39
Ordering Information . . . 39
Replaceable Parts Lists . . . 39

Chapter 4. Service 43
Introduction 43
Equipment Required 43
Service Aids 43
Troubleshooting Techniques 44
Identifying the Problem 44
Testing the Assembly 45
Repair and Maintenance Guidelines 46
ESD Precautions 46
Soldering Printed Circuit Boards 46
Post-Repair Safety Checks 46

Appendix A. Verification Tests - C Programs 47
Functional Verification Test 47
Example 47
Performance Verification Tests 48
Example: Closed Channel Resistance Test 48
Example: DC Isolation Test 50

Appendix B. Backdating Information 61
Introduction 61
Ordering Information 61
Replaceable Parts List 61

Certification

Agilent Technologies, Inc. certifies that this product met its published specifications at the time of shipment from the factory. Agilent Technologies further certifies that its calibration measurements are traceable to the United States National Institute of Standards and Technology (formerly National Bureau of Standards), to the extent allowed by that organization's calibration facility, and to the calibration facilities of other International Standards Organization members.

Warranty

This Agilent Technologies product is warranted against defects in materials and workmanship for a period of one year from date of shipment. Duration and conditions of warranty for this product may be superseded when the product is integrated into (becomes a part of) other Agilent products. During the warranty period, Agilent Technologies will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by Agilent Technologies. Buyer shall prepay shipping charges to Agilent and Agilent shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to Agilent from another country.

Agilent warrants that its software and firmware designated by Agilent for use with a product will execute its programming instructions when properly installed on that product. Agilent does not warrant that the operation of the product, or software, or firmware will be uninterrupted or error free.

Limitation Of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied products or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

The design and implementation of any circuit on this product is the sole responsibility of the Buyer. Agilent does not warrant the Buyer's circuitry or malfunctions of Agilent products that result from the Buyer's circuitry. In addition, Agilent does not warrant any damage that occurs as a result of the Buyer's circuit or any defects that result from Buyer-supplied products.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. AGILENT TECHNOLOGIES SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Exclusive Remedies

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. AGILENT TECHNOLOGIES SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

Notice

The information contained in this document is subject to change without notice. AGILENT TECHNOLOGIES MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Agilent shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this material. This document contains proprietary information which is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of Agilent Technologies, Inc. Agilent assumes no responsibility for the use or reliability of its software on equipment that is not furnished by Agilent.

U.S. Government Restricted Rights

The Software and Documentation have been developed entirely at private expense. They are delivered and licensed as "commercial computer software" as defined in DFARS 252.227-7013 (Oct 1988), DFARS 252.211-7015 (May 1991) or DFARS 252.227-7014 (Jun 1995), as a "commercial item" as defined in FAR 2.101(a), or as "Restricted computer software" as defined in FAR 52.227-19 (Jun 1987) (or any equivalent agency regulation or contract clause), whichever is applicable. You have only those rights provided for such Software and Documentation by the applicable FAR or DFARS clause or the Agilent standard software agreement for the product involved.

Agilent Technologies

E1364A 16-Channel Form C Switch Service Manual
Edition 4
Copyright © 1991-2005 Agilent Technologies, Inc. All Rights Reserved.

Documentation History

All Editions and Updates of this manual and their creation date are listed below. The first Edition of the manual is Edition 1. The Edition number increments by 1 whenever the manual is revised. Updates, which are issued between Editions, contain replacement pages to correct or add additional information to the current Edition of the manual. Whenever a new Edition is created, it will contain all of the Update information for the previous Edition. Each new Edition or Update also includes a revised copy of this documentation history page.

Edition 1 (Part Number E1364-90010). . . . . November 1991

Edition 2 (Part Number E1364-90011). . . . . April 1996

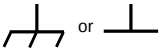
Edition 3 (Part Number E1364-90012). . . . . November 2005

Edition 3 Rev 1 (Part Number E1364-90012) . . . . . September 2012

Safety Symbols

Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific WARNING or CAUTION information to avoid personal injury or damage to the product.

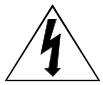
Indicates the field wiring terminal that must be connected to earth ground before operating the equipment—protects against electrical shock in case of fault.



Frame or chassis ground terminal—typically connects to the equipment's metal frame.

Alternating current (AC).

Direct current (DC).



Indicates hazardous voltages.

WARNING Calls attention to a procedure, practice, or condition that could cause bodily injury or death.

CAUTION Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Agilent Technologies Inc. assumes no liability for the customer's failure to comply with these requirements.

Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), an uninterruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.

For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holders.

Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to an Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

DO NOT service or adjust alone: Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Technologies Sales and Service Office for service and repair to ensure that safety features are maintained.

Declaration of Conformity

Declarations of Conformity for this product and for other Agilent products may be downloaded from the Internet. There are two methods to obtain the Declaration of Conformity:

- Go to **http://regulations.corporate.agilent.com/DoC/search.htm** . You can then search by product number to find the latest Declaration of Conformity.
- Alternately, you can go to the product web page **(www.agilent.com/find/9MOCП!),** click on the Document Library tab then scroll down until you find the Declaration of Conformity link.

Chapter 1
General Information

Introduction

This manual contains information required to test, troubleshoot, and repair the Agilent E1364A B-Size VXI Form C Switch. See the *Agilent E1364A User's Manual* for additional information. Figure 1-1 shows the E1364A Switch Module.

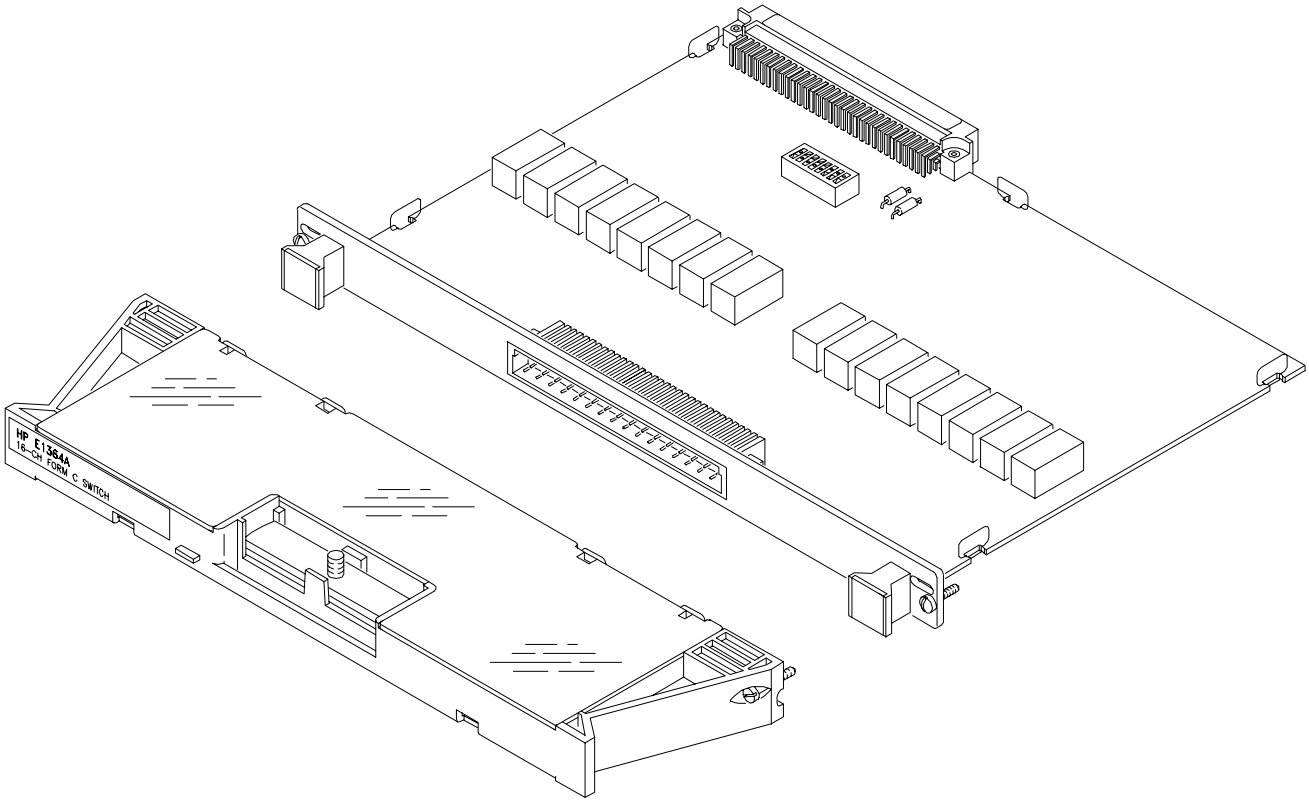


Figure 1-1. Agilent E1364A Form C Switch Module

Safety Considerations

This product is a Safety Class I instrument that is provided with a protective earth terminal when installed in the mainframe. The mainframe, switch, and all related documentation should be reviewed for familiarization with safety markings and instructions before operation or service.

Refer to the WARNINGS on page 6 in this manual for a summary of safety information. Safety information for preventive maintenance, testing, and service follows and is also found throughout this manual.

WARNINGS and CAUTIONS

This section contains WARNINGS which must be followed for your protection and CAUTIONS which must be followed to avoid damage to the equipment when performing instrument maintenance or repair.

WARNING

SERVICE-TRAINED PERSONNEL ONLY. The information in this manual is for service-trained personnel who are familiar with electronic circuitry and are aware of the hazards involved. To avoid personal injury or damage to the instrument, do not perform procedures in this manual or do any servicing unless you are qualified to do so.

CHECK MAINFRAME POWER SETTINGS. Before applying power, verify that the mainframe setting matches the line voltage and that the correct fuse is installed. An uninterruptible safety earth ground must be provided from the main power source to the supplied power cord set.

GROUNDING REQUIREMENTS. Interruption of the protective (grounding) conductor (inside or outside the mainframe) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two-conductor outlet is not sufficient protection.)

IMPAIRED PROTECTION. Whenever it is likely that instrument protection has been impaired, the mainframe must be made inoperative and be secured against any unintended operation.

REMOVE POWER IF POSSIBLE. Some procedures in this manual may be performed with power supplied to the mainframe while protective covers are removed. Energy available at many points may, if contacted, result in personal injury. (If maintenance can be performed without power applied, the power should be removed.)

WARNING **USING AUTOTRANSFORMERS. If the mainframe is to be energized via an autotransformer (for voltage reduction) make sure the common terminal is connected to neutral (that is, the grounded side of the main's supply).**

CAPACITOR VOLTAGES. Capacitors inside the mainframe may remain charged even when the mainframe has been disconnected from its source of supply.

USE PROPER FUSES. For continued protection against fire hazard, replace the line fuses only with fuses of the same current rating and type (such as normal blow, time delay, etc.). Do not use repaired fuses or short-circuited fuseholders.

CAUTION **Static electricity is a major cause of component failure. To prevent damage to the electrical components in the switch, observe anti-static techniques whenever working on the switch.**

Inspection/Shipping

This section contains initial (incoming) inspection and shipping guidelines for the E1364A Switch Module.

Initial Inspection

Use the steps in Figure 1-2 as guidelines to perform initial inspection of the switch module.

WARNING **To avoid possible hazardous electrical shock, do not perform electrical tests if there are signs of shipping damage to the shipping container or to the instrument.**

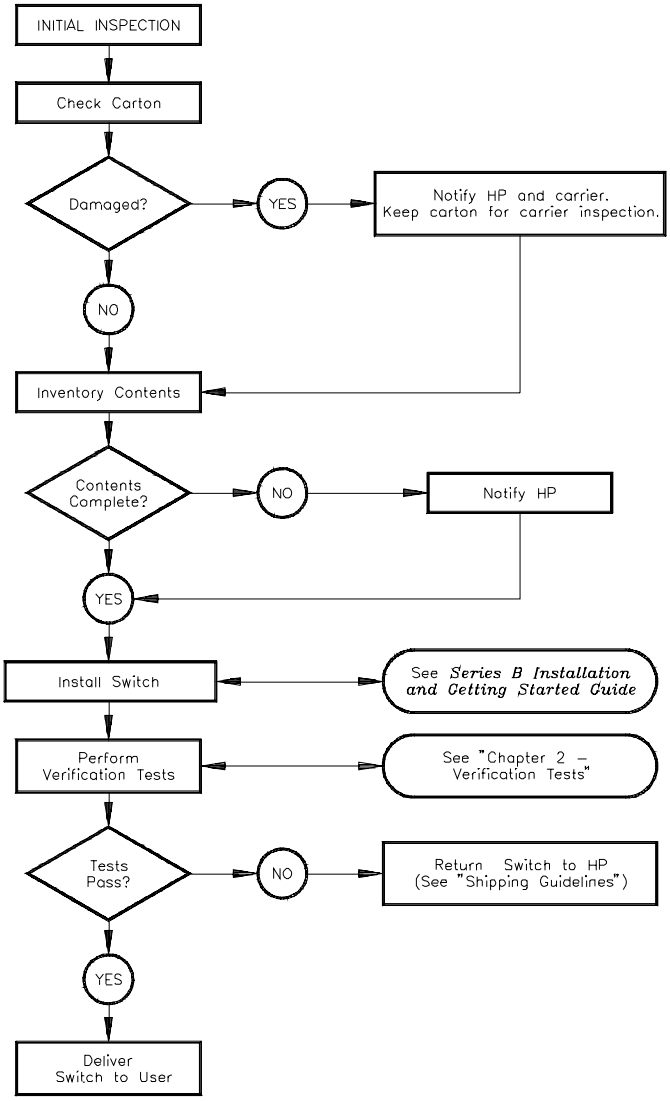
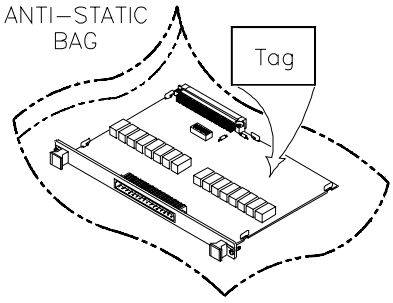


Figure 1-2. Initial (Incoming) Inspection Guidelines

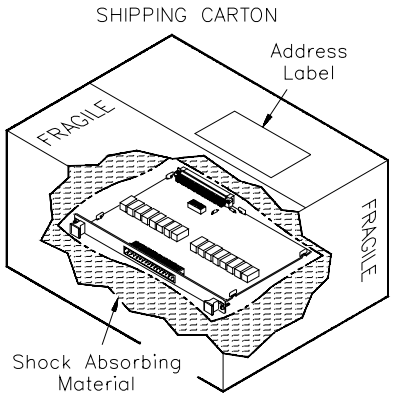
Shipping Guidelines

Follow the steps in Figure 1-3 to return the E1364A Switch Module to an Agilent Technologies Sales and Support Office or Service Center.



1. Prepare the Switch

   - Remove user wiring from terminal module.
   - Attach tag to switch that identifies:
     - Owner
     - Model Number/Serial Number
     - Service Required
   - Place tagged device in approved anti-static bag.



2. Package the Switch

   - Place packaged switch in shipping carton.*
   - Place 75 to 100 mm (3 to 4 inches) of shock-absorbing material around the module.
   - Seal the shipping container securely.
   - Mark the shipping container FRAGILE.

3. Ship the Switch to Hewlett-Packard

   - Place address label on shipping carton.
   - Send carton to Agilent Technologies.

* We recommend that you use the same shipping materials as those used in factory packaging (available from Agilent). For other (commercially available) shipping materials, use a double-walled carton with minimum 2.4 MPa (350 psi) test.

Figure 1-3. Packaging/Shipping Guidelines

Environment

The recommended operating environment for the E1364A Switch Module is:

Environment	**Temperature**	**Humidity**
Operating	0°C to +55°C	<65% relative (0°C to +40°C)
Storage and Shipment	-40°C to +75°C	<65% relative (0°C to +40°C)

Switch Description

The Agilent E1364A Switch Module is an "instrument" in the slots of a VXIbus mainframe. As such, it is assigned an error queue, input and output buffers, and a status register. The switch has 16 channels of Form C relays. Each channel includes a relay with common (C), normally open (NO), and normally closed (NC) contacts.

NOTE Instruments are based on the logical addresses of the plug-in modules. See Chapter 1 of the *E1364A User's Manual* to set the logical address of the switch module.

Switch Specifications

Switch module specifications are listed in Appendix A of the *E1364A User's Manual*. These specifications are the performance standards or limits against which the instrument may be tested.

Switch Serial Numbers

Switches covered by this manual are identified by a serial number prefix listed on the title page. Agilent uses a two-part serial number in the form XXXXAYYYYY, where XXXX is the serial prefix, A is the country of origin (A=USA), and YYYYY is the serial suffix. The serial number prefix identifies a series of identical instruments. The serial number suffix is assigned sequentially to each instrument.

The serial number plate is located on the backplane connector. If the serial number prefix of your instrument is greater than the one listed on the title page, a Manual Update (as required) will explain how to adapt this manual to your instrument.

Switch Options

There are no electrical or mechanical options available for the E1364A Switch Module.

Recommended Test Equipment

Table 1-1 lists the test equipment recommended for testing, adjusting, and servicing the E1364A Switch Module. Essential requirements for each piece of test equipment are described in the "Requirements" column.

Table 1-1. Recommended Test Equipment

Instrument	**Requirements**	**Recommended Model**	**Use***
Controller, GP-IB	GP-IB compatibility as defined by IEEE Standard 488-1978 and the identical ANSI Standard MC1.1: SH1, AH1, T2, TE0, L2, LE0, SR0, RL0, PP0, DC0, DT0, and C1, 2, 3, 4, 5.	HP 9000 Series 300 or IBM compatible PC with HP BASIC	F,O, P,T
Mainframe	Compatible with switch Use the E1403B A/B-to-C-size Adapter to install a B-size module in a C-size E14XX mainframe.	E1300A, E1301A, E1302A (requires E1306A**) E1400B/T (requires E1405A/B or E1406B**), E1401B/T (requires E1405A/B or E1406B**), E1421B (requires E1405A/B or E1406B**) ** or an embedded controller or VXLink in place of a command module.	F,O, P,T
Digital Multimeter	2-wire ohms (up to 1 GΩ) 4-wire ohms	3458A 34401A	O,P,T

* F = Functional Verification, O = Operation Verification Tests,
P = Performance Verification Tests, T = Troubleshooting

Chapter 2
Verification Tests

Introduction

The three levels of test procedures described in this chapter are used to verify that the E1364A Switch Module:

- is fully functional (Functional Verification)
- meets selected testable specifications (Operation Verification)
- meets all testable specifications (Performance Verification)

Test Conditions and Procedures

See Table 1-1 for test equipment requirements. You should complete the Performance Verification tests at least once a year. For heavy use or severe operating environments, perform the tests more often.

The verification tests assume that the person performing the tests understands how to operate the mainframe, the switch, and specified test equipment. The test procedures do not specify equipment settings for test equipment, except in general terms. It is assumed that a qualified, service-trained technician will select and connect the cables, adapters, and probes required for the test.

Performance Test Record

The results of each Performance Verification test may be recorded in Table 2-1, "Agilent E1364A Performance Test Record." You may make a copy of this form, if desired.

Verification Test Examples

Each verification test procedure includes an example program that performs the test. All example programs assume the following configuration:

- Controller is an HP 9000 Series 200/300 computer
- Programming language is BASIC
- Switch address is 70915
- Switch card number is 1
- DMM is an 3458A

Functional Verification

The Functional Verification Test for the E1364A switch consists of sending the *IDN? command and checking the response. This test can be used at any time to verify that the switch is connected properly and is responding to basic commands.

Procedure

1. Verify that the switch is installed in the mainframe and that the mainframe has passed its power-on test.
2. Send the *IDN? command to the switch module (see example following).
3. The switch module should return the following string (revision number may vary):

   HEWLETT-PACKARD,SWITCHBOX,0,A.06.00

NOTE If the primary address setting, secondary address setting, or interface select code is set incorrectly, the switch will not respond. Verify proper address selection before troubleshooting.

Example

An example follows which uses an HP 9000 Series 300 computer with HP BASIC and a switch address of 70915.

```
10   DIM A$[80]
20   OUTPUT 70915;"*IDN?"        !Send the ID command
30   ENTER 70915;A$              !Get response
40   PRINT A$
50   END
```

Operation Verification

The procedures in this section are used to provide a high confidence that the switch module is meeting published specifications. The Operation Verification tests are a subset of the Performance Verification tests and are suitable for checkout after performing repairs.

Operation Verification is performed by completing the Closed-Channel Resistance Test as described in the Performance Verification test procedures. This test is usually sufficient to verify that the switch module is meeting its specifications.

Performance Verification

The procedures in this section are used to test the switch module's electrical performance using the specifications in Appendix A of the *E1364A User's Manual* as the performance standards. These tests are suitable for incoming inspection, troubleshooting, and preventive maintenance.

Test Fixture

A test fixture is required for the following tests. It is recommended that you order an extra terminal module (aka "terminal block") to use as a test fixture, so that you do not have to re-wire the terminal module each time these tests are performed. The terminal module part number is E1364-80001.

Figures 2-1(a) and 2-1(b) show how the test fixture should be wired. Perform the following steps to wire the test fixture:

- Short all NO (Normally Open) lines together.
- Short all NC (Normally Closed) lines together.
- Short all C (Common) lines together.

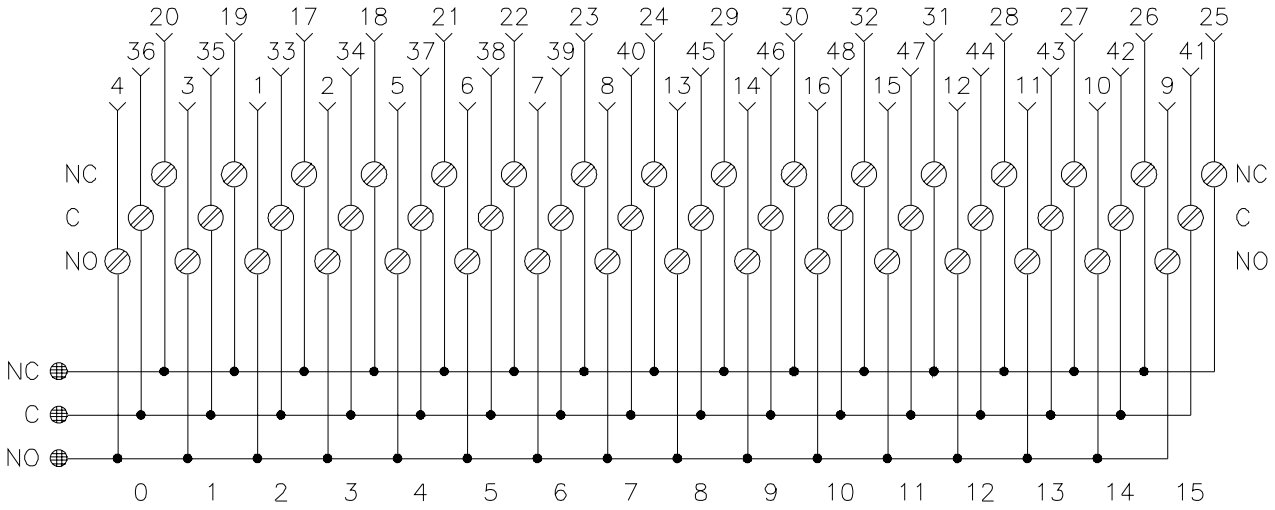


Figure 2-1(a). Agilent E1364A Test Fixture Schematic

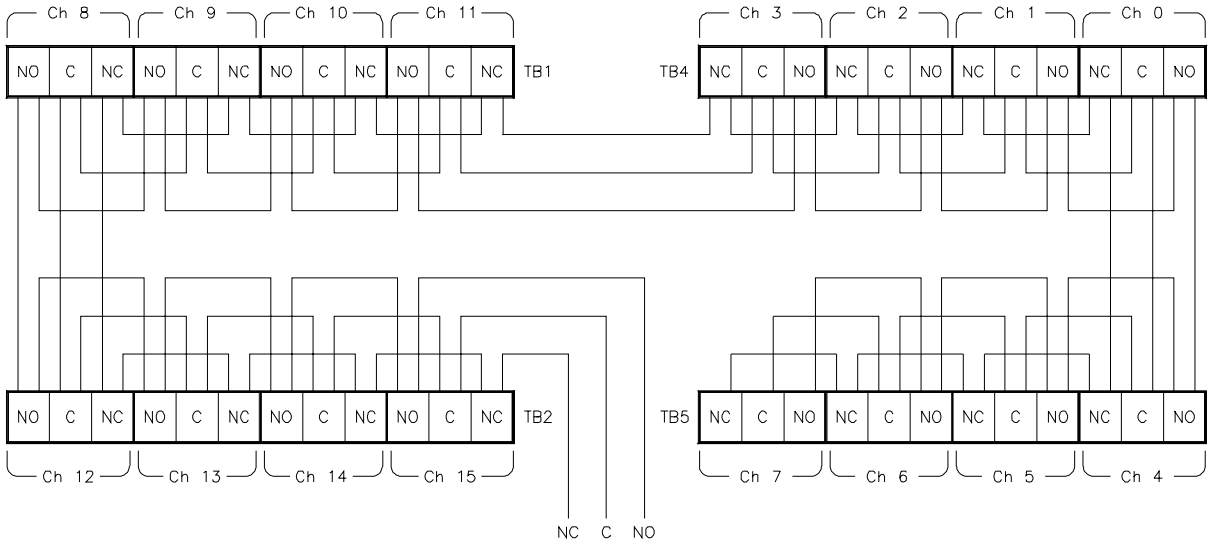

Ch 8
Ch 9
Ch 10
Ch 11
Ch 3
Ch 2
Ch 1
Ch 0
NO C NC NO C NC NO C NC NO C NC TB1
TB4 NC C NO NC C NO NC C NO NC C NO
NO C NC NO C NC NO C NC NO C NC TB2
TB5 NC C NO NC C NO NC C NO NC C NO
Ch 12
Ch 13
Ch 14
Ch 15
Ch 7
Ch 6
Ch 5
Ch 4
NC C NO

Figure 2-1(b). Agilent E1364A Test Fixture

Test 2-1: Closed-Channel Resistance Test

The purpose of this test is to verify that all relay contacts meet the closed-channel resistance specification for the switch module. If the closed-channel resistance of any contact is greater than 3.5 Ω, the relay should be replaced.

Normally Open Contacts

1. Hardware Connections

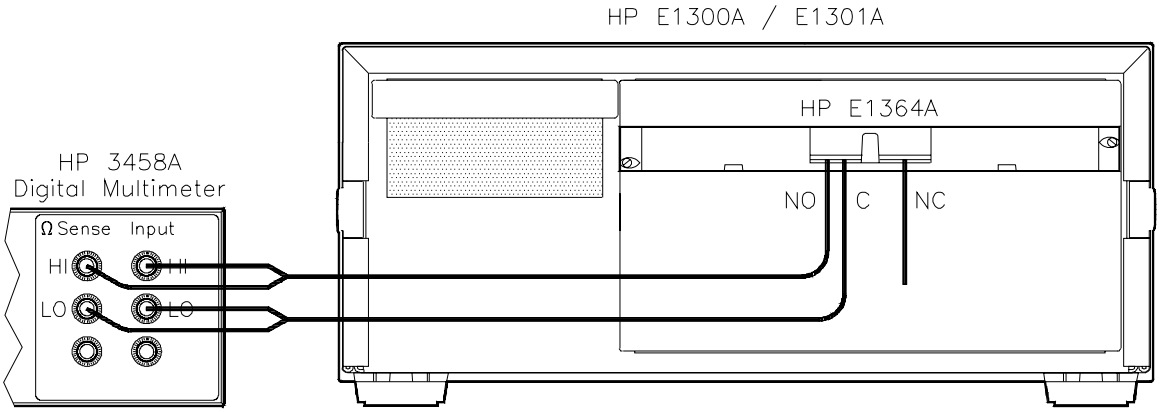


Figure 2-2. Closed-Channel Resistance (NO channels)

2. Equipment Setup

- Set DMM to: 4-wire ohms, autorange.
- Send *RST to the switch to open all NO contacts.

3. Closed-Channel Reading (channel 00)

- Send CLOS (@100) to the switch to close channel 00.
- Trigger the DMM and record the reading.

4. Open-Channel Reading (channel 00)

- Send OPEN (@100) to the switch to open channel 00.
- Trigger the DMM and verify that an open circuit is indicated ($>10^8$ Ω).

5. Closed- and Open-Channel Readings (channels 01-15)

- Repeat steps 3 and 4 for channels 01 through 15. Use CLOS (@ccnn) and OPEN (@ccnn), where

  cc = switch card number (01-99, leading zero not necessary)
  nn = channel number (00-15)

Normally Closed Contacts

1. Hardware Connections

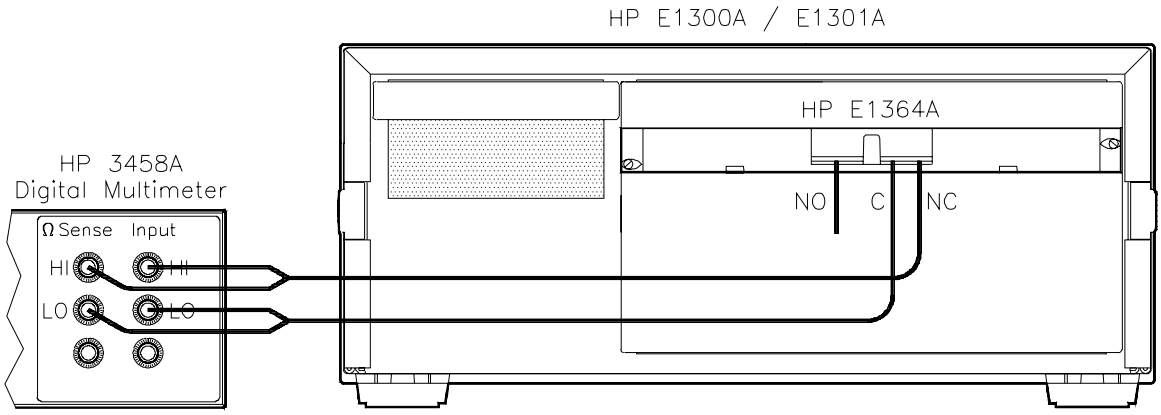


Figure 2-3. Closed-Channel Resistance (NC Channels)

2. Equipment Setup

- Set DMM to: 4-wire ohms, autorange.
- Send *RST to the switch.
- Send CLOS (@100:115) to the switch to open all NC contacts.

3. Closed-Channel Reading (channel 00)

- Send OPEN (@100) to the switch to close channel 00.
- Trigger the DMM and record the reading.

4. Open-Channel Reading (channel 00)

- Send CLOS (@100) to the switch to open channel 00.
- Trigger the DMM and verify that an open circuit is indicated ($>10^8$ Ω).

5. Closed- and Open-Channel Readings (channels 01-15)

- Repeat steps 3 and 4 for channels 01 through 15. Use CLOS (@ccnn) and OPEN (@ccnn), where

  cc = switch card number (01-99, leading zero not necessary)
  nn = channel number (00-15)

Example: Closed-Channel Resistance Test

This example performs the Closed-Channel Resistance Test for all Normally Open and Normally Closed contacts.

```
10    ! RE-STORE "CONTACT_RES"
20    ASSIGN @Switch TO 70915
30    ASSIGN @Dmm TO 722
40    !
50    OUTPUT @Switch;"*RST"      !Open all NO contacts
60    OUTPUT @Dmm;"PRESET NORM;TRIG HOLD"
70    OUTPUT @Dmm;"FUNC OHMF"
80    !
90    !---------- NORMALLY OPEN CONTACTS ----------
100   DISP "Connect DMM to NO and C lines of E1364A (4-wire
connection)"
110   PAUSE
120   DISP
130   PRINT "Contact Resistance -- Normally Open Contacts"
140   PRINT
150   !
160   FOR I=0 TO 15
170       !Closed-channel resistance (NO contacts)
180       OUTPUT @Switch;"CLOS (@"&VAL$(100+I)&")"
190       OUTPUT @Dmm;"TRIG SGL"
200       ENTER @Dmm;Rdg
210       PRINT "Channel "&VAL$(I)&" (closed):  "&VAL$(Rdg)
220   !
230       !Open-channel resistance (NO contacts)
240       OUTPUT @Switch;"OPEN (@"&VAL$(100+I)&")"
250       OUTPUT @Dmm;"TRIG SGL"
260       ENTER @Dmm;Rdg
270       PRINT "Channel "&VAL$(I)&" (open):    "&VAL$(Rdg)
280       PRINT
290   NEXT I
300   !
310   !---------- NORMALLY CLOSED CONTACTS ----------
320   DISP "Connect DMM to NC and C lines of E1364A (4-wire
connection)"
330   PAUSE
340   DISP
350   PRINT "Contact Resistance -- Normally Closed Contacts"
360   PRINT
370   !
```

Continued on Next Page

```
380   OUTPUT @Switch;"CLOS (@100:115)"      !Open all NC contacts
390   FOR I=0 TO 15
400      !Closed-channel resistance (NC contacts)
410      OUTPUT @Switch;"OPEN (@"&VAL$(100+I)&")"
420      OUTPUT @Dmm;"TRIG SGL"
430      ENTER @Dmm;Rdg
440      PRINT "Channel "&VAL$(I)&" (closed):  "&VAL$(Rdg)
450   !
460      !Open-channel resistance (NC contacts)
470      OUTPUT @Switch;"CLOS (@"&VAL$(100+I)&")"
480      OUTPUT @Dmm;"TRIG SGL"
490      ENTER @Dmm;Rdg
500      PRINT "Channel "&VAL$(I)&" (open):    "&VAL$(Rdg)
510      PRINT
520   NEXT I
530   !
540   END
```

Test 2-2: DC Isolation Test

This test verifies that sufficient DC isolation exists between various points on the switch module. The DMM used should be capable of measuring up to at least 1 GΩ. If the DMM indicates an overload, record the reading as ">R_{max}", where R_{max} is the highest resistance that the DMM can measure. If the DMM is a 3458A, for example, the reading should be written as ">1.2 GΩ".

Normally Open to Common

1. Hardware Connections

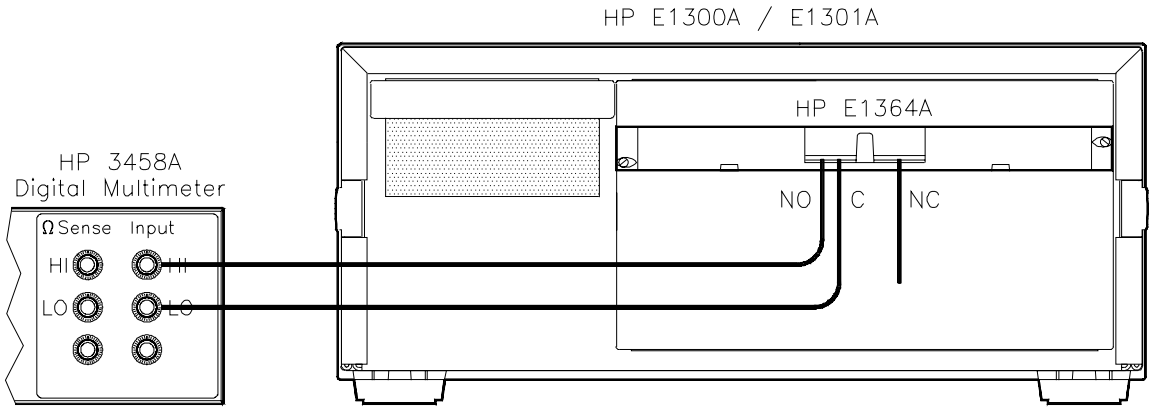


Figure 2-4. DC Isolation Test (NO Channels to Common)

2. Equipment Setup
   - Set DMM to: 2-wire ohms, 1 GΩ range.
   - Send *RST to the switch to open all NO contacts.
3. DC Isolation Reading
   - Trigger the DMM and record the reading.

Normally Closed to Common

1. Hardware Connections

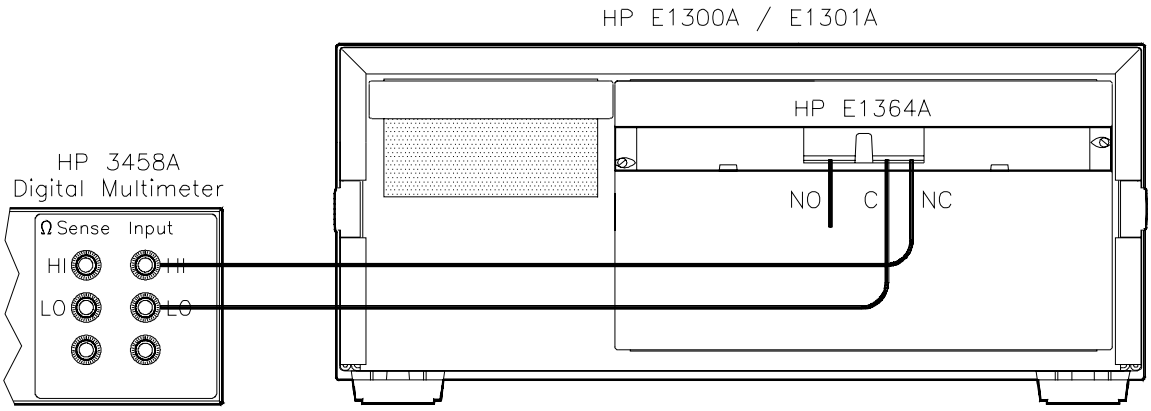


Figure 2-5. DC Isolation Test (NC Channels to Common)

2. Equipment Setup

- Set DMM to: 2-wire ohms, 1 GΩ range.
- Send *RST to the switch.
- Send the CLOS (@100:115) command to the switch to open all NC contacts.

3. DC Isolation Reading

- Trigger the DMM and record the reading.

Normally Open to Chassis

1. Hardware Connections

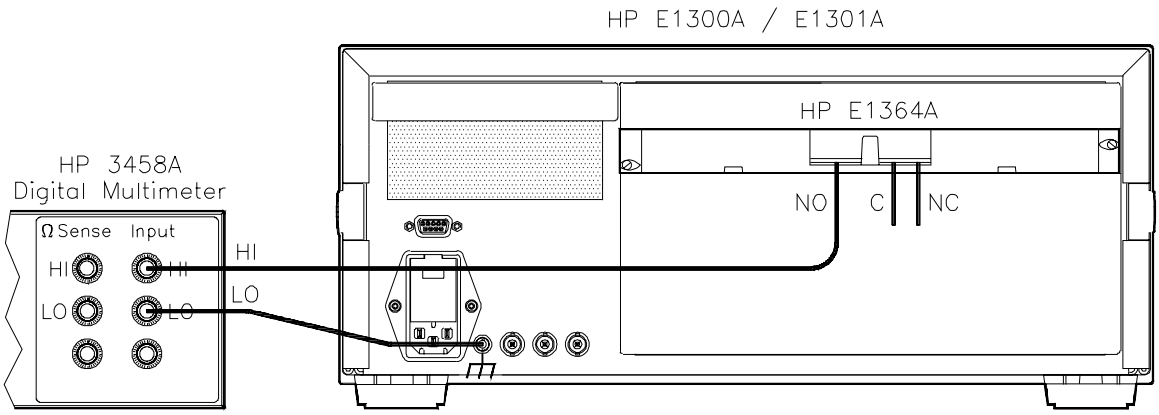


Figure 2-6. DC Isolation Test (NO Channels to Chassis)

2. Equipment Setup

- Set DMM to: 2-wire ohms, 1 GΩ range.
- Send *RST to the switch.
- Send the CLOS (@100:115) command to the switch to close all NO contacts.

3. DC Isolation Reading

- Trigger the DMM and record the reading.

1. Hardware Connections

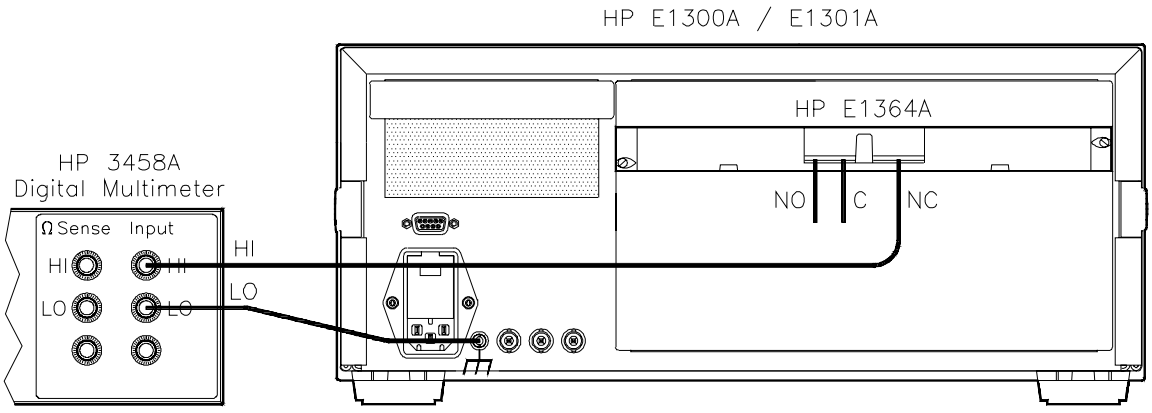


Figure 2-7. DC Isolation Test (NC Channels to Chassis)

2. Equipment Setup
   - Set DMM to: 2-wire ohms, 1 GΩ range.
   - Send *RST to the switch to close all NC contacts.

3. DC Isolation Reading
   - Trigger the DMM and record the reading.

Example: DC Isolation Test

This example performs the DC Isolation Test for Normally Open and Normally Closed channels to both Common and chassis (earth ground).

```
10   !RE-STORE "DC_ISOL"
20   ASSIGN @Switch TO 70915
30   ASSIGN @Dmm TO 722
40   !
50   OUTPUT @Dmm;"PRESET NORM;TRIG HOLD"
60   OUTPUT @Dmm;"FUNC OHM;RANGE 1E9"
70   !
80   !---------------NORMALLY OPEN TO COMMON---------------
90   DISP "Connect DMM HI and LO to E1364A NO and C lines"
100  PAUSE
110  DISP
120  !
130  OUTPUT @Switch;"*RST"      !Open all NO contacts
140  WAIT 1
150  OUTPUT @Dmm;"TRIG SGL"
160  ENTER @Dmm;Rdg
170  !
180  PRINT "DC Isolation -- Normally Open Channels to Common"
190  PRINT "R = "&VAL$(Rdg)
200  PRINT
210  !
220  !---------------NORMALLY CLOSED TO COMMON---------------
230  DISP "Connect DMM HI and LO to E1364A NC and C lines"
240  PAUSE
250  DISP
260  !
270  OUTPUT @Switch;"CLOS (@100:115)"   !Open all NC contacts
280  WAIT 1
290  OUTPUT @Dmm;"TRIG SGL"
300  ENTER @Dmm;Rdg
310  !
320  PRINT "DC Isolation -- Normally Closed Channels to Common"
330  PRINT "R = "&VAL$(Rdg)
340  PRINT
350  !
360  !---------------NORMALLY OPEN TO CHASSIS---------------
370  DISP "Connect DMM HI and LO to E1364A NO line and mainframe
chassis"
380  PAUSE
390  DISP
400  !
```

Continued on Next Page

```
410   OUTPUT @Dmm;"TRIG SGL"
420   ENTER @Dmm;Rdg
430   !
440   PRINT "DC Isolation -- Normally Open Channels to Chassis"
450   PRINT "R = "&VAL$(Rdg)
460   PRINT
470   !
480   !---------------NORMALLY CLOSED TO CHASSIS---------------
490   DISP "Connect DMM HI and LO to E1364A NC line and mainframe
chassis"
500   PAUSE
510   DISP
520   !
530   OUTPUT @Switch;"OPEN (@100:115)"    !Close all NC contacts
540   WAIT 1
550   OUTPUT @Dmm;"TRIG SGL"
560   ENTER @Dmm;Rdg
570   !
580   PRINT "DC Isolation -- Normally Closed Channels to Chassis"
590   PRINT "R = "&VAL$(Rdg)
600   !
610   END
```

Performance Test Record

Table 2-1, "Performance Test Record for the E1364A Switch Module," is a form you may copy and use to record performance verification test results for the switch module. Pages 3 and 4 of Table 2-1 show switch accuracy, measurement uncertainty (M.U.), and test accuracy ratio (TAR) values.

Switch Accuracy

Accuracy is defined for closed-channel contact resistance and DC isolation using the specifications in Appendix A of the *E1364A User's Manual*. The closed-channel resistance and DC isolation specifications are single-sided, meaning that there is an upper limit OR a lower limit, but not both. In Table 2-1, either the "Minimum" or "Maximum" column will be blank for a single-sided test.

Measurement Uncertainty

For the performance verification tests in this manual, the measurement uncertainties are based on 90-day accuracy specifications for the 3458A Digital Multimeter. The calculations are shown below.

Closed-Channel Resistance Test

Conditions:

- 4-wire ohms function
- 10 Ω range
- 90-day specifications
- Worst-case reading = 3.5 Ω

M.U. = 15ppm of Reading + 5ppm of Range

$= 15 \times 10^{-6} \cdot 3.5 + 5 \times 10^{-6} \cdot 10 \quad (\Omega)$

$= 1.03 \times 10^{-4}\ \Omega$

DC Isolation Test

Conditions:

- 2-wire ohms function
- 1 GΩ range
- 90-day specifications
- Worst-case reading = 1.2 GΩ (highest resistance that can be measured with the 3458A)

M.U. = 0.5% of Reading + 10ppm of Range

$= 0.005 \cdot 1.2 \times 10^{9} + 10 \times 10^{-6} \cdot 1 \times 10^{9}\ (\Omega)$

$= 6 \times 10^{6}\ \Omega$

Test Accuracy Ratio (TAR)

Test Accuracy Ratios are not defined for single-sided measurements, so all closed-channel resistance and DC isolation measurements have "NA" (Not Applicable) in the TAR column.

Table 2-1. Performance Test Record for the E1364A Switch Module (Page 1 of 4)

Test Facility:

Name_____ Report No._____

Address_____ Date_____

City/State_____ Customer_____

Phone_____ Tested by_____

Model _____ Ambient temperature_____ ^{o}C

Serial No._____ Relative humidity_____%

Options_____ Line frequency_____ Hz (nominal)

Firmware Rev._____

Special Notes:

Table 2-1. Performance Test Record for the E1364A Switch Module (Page 2 of 4)

Model _____ **Report No.** _____ **Date** _____

Test Equipment Used: Description	**Model No.**	**Trace No.**	**Cal Due Date**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

Table 2-1. Performance Test Record for the E1364A Switch Module (Page 3 of 4)

Model _____ **Report No.** _____ **Date**_____

Test No.	Test Description	Minimum*	Measured Reading	Maximum	Meas Uncert	TAR
2-1. Closed-Channel Resistance Test (Values in ohms)						
Normally Open (NO) Contacts						
	Channel 00		_____	3.5	1.03E-4	NA
	Channel 01		_____	3.5	1.03E-4	NA
	Channel 02		_____	3.5	1.03E-4	NA
	Channel 03		_____	3.5	1.03E-4	NA
	Channel 04		_____	3.5	1.03E-4	NA
	Channel 05		_____	3.5	1.03E-4	NA
	Channel 06		_____	3.5	1.03E-4	NA
	Channel 07		_____	3.5	1.03E-4	NA
	Channel 08		_____	3.5	1.03E-4	NA
	Channel 09		_____	3.5	1.03E-4	NA
	Channel 10		_____	3.5	1.03E-4	NA
	Channel 11		_____	3.5	1.03E-4	NA
	Channel 12		_____	3.5	1.03E-4	NA
	Channel 13		_____	3.5	1.03E-4	NA
	Channel 14		_____	3.5	1.03E-4	NA
	Channel 15		_____	3.5	1.03E-4	NA
Normally Closed (NC) Contacts						
	Channel 00		_____	3.5	1.03E-4	NA
	Channel 01		_____	3.5	1.03E-4	NA
	Channel 02		_____	3.5	1.03E-4	NA
	Channel 03		_____	3.5	1.03E-4	NA
	Channel 04		_____	3.5	1.03E-4	NA
	Channel 05		_____	3.5	1.03E-4	NA
	Channel 06		_____	3.5	1.03E-4	NA
	Channel 07		_____	3.5	1.03E-4	NA
	Channel 08		_____	3.5	1.03E-4	NA
	Channel 09		_____	3.5	1.03E-4	NA
	Channel 10		_____	3.5	1.03E-4	NA
	Channel 11		_____	3.5	1.03E-4	NA
	Channel 12		_____	3.5	1.03E-4	NA
	Channel 13		_____	3.5	1.03E-4	NA
	Channel 14		_____	3.5	1.03E-4	NA
	Channel 15		_____	3.5	1.03E-4	NA

*Single-sided specification -- Minimum does not apply.

Table 2-1. Performance Test Record for the E1364A Switch Module (Page 4 of 4)

Model _____ **Report No**. _____ **Date**_____

Test No.	Test Description	Minimum	Measured Reading	Maximum*	Meas Uncert	TAR
2-3. DC Isolation Test (Values in ohms)						
	NO to Common	1E8	_____		6.0E6	NA
	NC to Common	1E8	_____		6.0E6	NA
	NO to chassis	1E8	_____		6.0E6	NA
	NC to chassis	1E8	_____		6.0E6	NA

*Single-sided specification -- Maximum does not apply.

Chapter 3
Replaceable Parts

Introduction

This chapter contains information for ordering replaceable parts for the E1364A Switch Modules with serial number 2934A10370 and higher. The tables provide the following information:

- Table 3-1 lists assembly and terminal module part numbers for the E1364A Switch Module.
- Table 3-2 lists the Reference Designators for the switch module.

Ordering Information

To order a part listed in Table 3-1, specify the Agilent part number and the quantity required. Send the order to your nearest Agilent Technologies Sales and Support Office.

If your E1364A Switch Module has a serial number prior to 2934A10370, see Appendix B, "Backdating Information," for replaceable parts information.

Replaceable Parts Lists

See the Parts Locator Diagrams (Figures 3-1 and 3-2) for locations of replaceable parts.

Table 3-1. E1364A Replaceable Parts (serial number 2934A10370 and higher)

Reference Designator	Part Number	Qty	Part Description
	E1364-66201	**1**	**COMPONENT ASSEMBLY**
BRK1-BRK2	0050-2183	2	BRKT-PNL MNT
F1	2110-0936	1	FUSE 4A 125V SMT
F2	2110-0936	1	FUSE 4A 125V SMT
J1	1252-1591	1	CONNECTOR-RA PL, 48P
LBL1	E1300-84308	1	LBL LOGO B SIZE
LBL2	E1300-84312	1	LBL-LOGO VXI B SIZE
K100-K115	0490-1912	16	RELAY-ARMATURE HiR, Low E
MP1-2	1400-1546	2	BRACKET PC BOARD HOLDER; BLACK; EXTRUDED
P1	1252-1596	1	CONNECTOR-POST TYPE 2.54-PIN-SPCG 96-CONTACT
SCR1-2	0515-0444	2	SCREW- X 8MM-LG -HD
SCR3-4	0515-1968	2	SCR PHM 2.5 X 11 TX
SHD1	E1300-80601	1	SHIELD SAFETY
SW1	3101-3142	1	SWITCH-DIP 8 - 1A SMTV
	E1364-80001	**1**	**TERMINAL MODULE**
	E1364-66510	1	TERMINAL CARD 16-CH GP RLY SWITCH
	E1300-84401	1	TERMINAL CARD, CASE ASSY

Table 3-2. Reference Designators

A	assembly	PCB	printed circuit board
BRK	bracket	PNL	panel
C	capacitor	R	resistor
CR	diode	RP	resistor pack
LBL	label	RVT	rivet
F	fuse	SCR	screw
J	electrical connector (jack)	SHD	shield
JM	jumper	SW	switch
K	relay	TB	terminal block (module)
MP	mechanical part	U	integrated circuit
P	electrical connector (plug)		

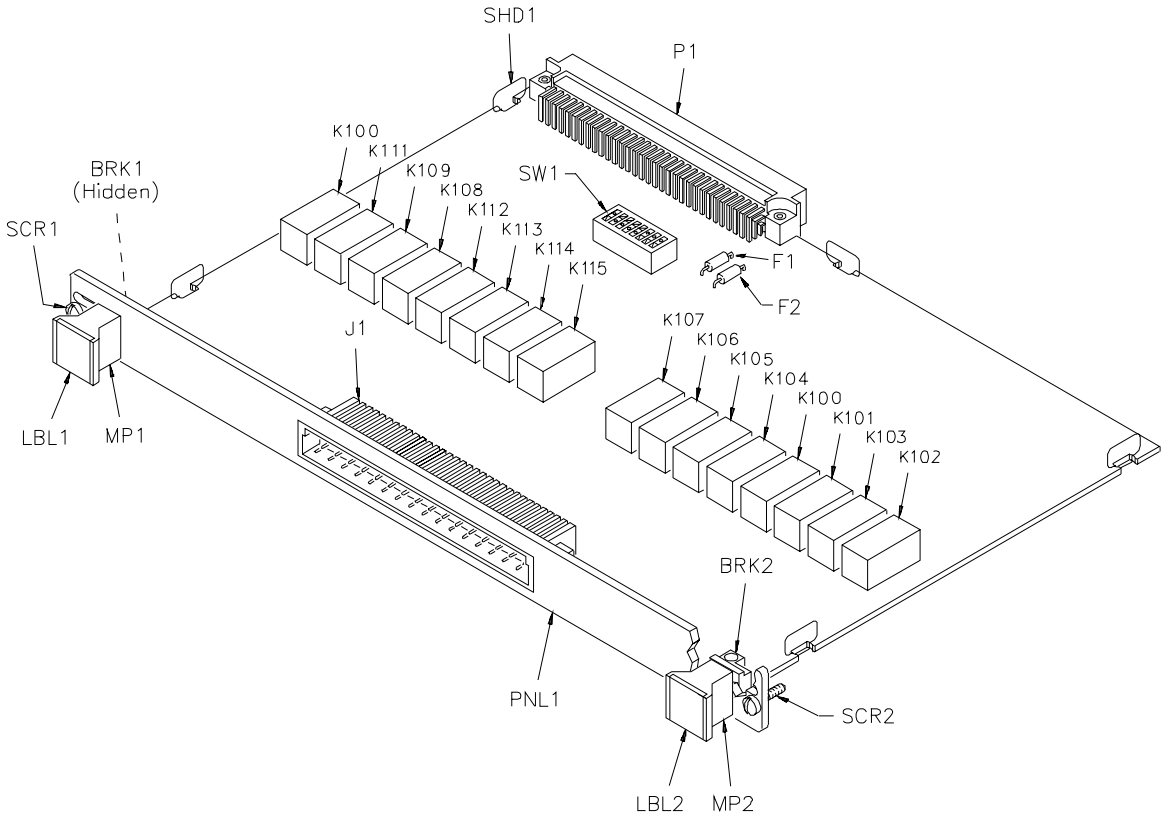


Figure 3-1. E1364A Mechanical Replaceable Parts

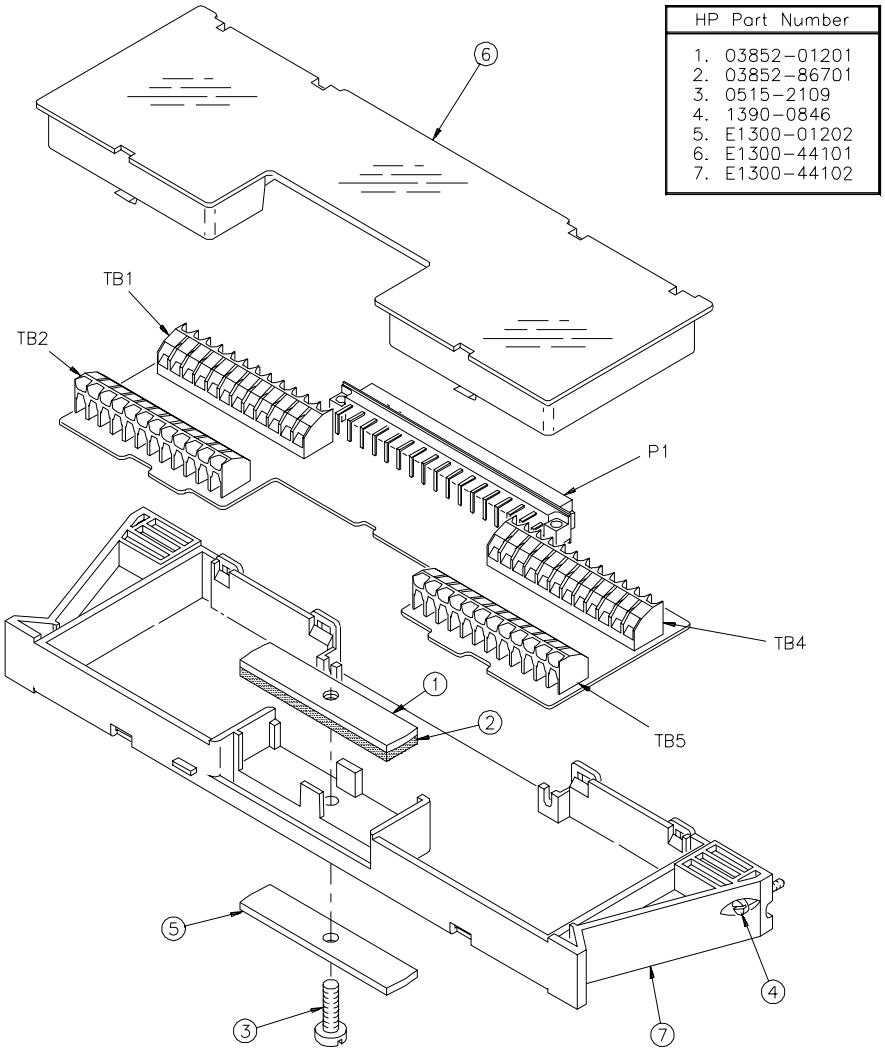


Figure 3-2. E1364A Terminal Block Replaceable Parts

Chapter 4
Service

Introduction

This chapter contains service information for the Agilent E1364A Switch Module, including troubleshooting techniques and repair and maintenance guidelines.

WARNING **Do not perform any of the service procedures shown unless you are a qualified, service-trained technician, and have read the WARNINGS and CAUTIONS in Chapter 1.**

Equipment Required

Equipment required for switch troubleshooting and repair is listed in Table 1-1, "Recommended Test Equipment." Any equipment that satisfies the requirements given in the table may be substituted. To avoid damage to the screw head slots, use a T8 Torx driver to remove the front panel handles.

Service Aids

See Chapter 3, "Replaceable Parts," *or* Appendix B, "Backdating Information," for descriptions and locations of E1364A replaceable parts, depending on the serial number of your switch module. Schematic Diagrams are available at the back of this manual. Service notes, manual updates, and service literature for the switch may be available through Agilent. For information, contact your nearest Agilent Technologies Sales and Support Office.

Troubleshooting Techniques

To troubleshoot an E1364A Switch Module problem, you should first identify the problem and then isolate the cause to a replaceable part. See Chapter 3, "Replaceable Parts," *or* Appendix B, "Backdating Information," for descriptions and locations of replaceable parts, depending on the serial number of your switch module.

Identifying the Problem

Table 4-1 lists some common problems, along with symptoms and possible solutions. If the problem persists, perform component-level troubleshooting using the component locator and schematics.

Table 4-1. Agilent E1364A Tests/Checks

Problem Type	Symptom	Possible Solutions
Operator Errors	Non-zero error code in response to the SYST:ERR? command.	See Appendix C of the *E1364A User's Manual* for Switch errors and causes. See Appendix B of the *E1300A/E1301A or E1302A User's Manual* for additional information on operator errors.
Catastrophic Failures	Switch not responding to commands.	Check logical address setting. See "Testing the Assembly" in this chapter.
Performance Out of Specification	Switch failing Closed-channel Resistance Test (Test 2-1).	Check user wiring and test connections. Replace relays that correspond to the channels that are failing. For example, if channel 15 fails, replace relay K115. If most of the channels are near or above the test limit (3.5 Ω), replace the entire module (part number E1364-66201).
	Switch failing DC Isolation Test (Test 2-2).	Check user wiring and test connections. Clean the printed circuit board.

Testing the Assembly

You can use the tests and checks in Table 4-2 to isolate the problem. See Figure 3-1 in Chapter 3 *or* Figure B-1 in Appendix B for locations of replaceable parts, depending on the serial number of your switch module.

Table 4-2. E1364A Tests/Checks

Test/Check	Reference Designator	Check:
Heat Damage	- - - - - - - - - -	Discolored PC boards Damaged insulation Evidence of arcing
Switch/Jumper Settings	JM13, JM14, ..., JM26 SP1	IRQ Level setting LADDR setting
Switch PCA	F1, F2 P1, J1 K100, K101, ..., K115	Fuse continuity Connector contacts Relay contact resistance

Checking for Heat Damage

Inspect the switch for signs of abnormal internally generated heat such as discolored printed circuit boards or components, damaged insulation, or evidence of arcing. If there is damage, do not operate the switch until you have corrected the problem.

Checking Switches/Jumpers

Verify that the logical address setting is set correctly (factory set at 120). Verify that the interrupt priority jumpers are set correctly (factory set at level 1). See the *E1364A User's Manual* for information.

Checking the Switch PCA

Use the replaceable parts locator (Figure 3-1 *or* B-1, depending on the serial number of your switch module) to check the following:

- Verify that fuses F1 and F2 are good.
- Check the closed-channel resistance of all relays using the procedure in Chapter 2. Replace any bad relays.
- Check connectors P1 and J1 for damage.

NOTE If the preceding steps fail to isolate the problem, use the schematics included with this manual to perform component-level troubleshooting.

Repair and Maintenance Guidelines

This section provides guidelines for repairing and maintaining the E1364A Switch Module, including:

- ESD precautions
- Soldering printed circuit boards
- Post-repair safety checks

ESD Precautions

Electrostatic discharge (ESD) may damage static sensitive devices in the E1364A Switch Module. This damage can range from slight parameter degradation to catastrophic failure. When handling switch assemblies, follow these guidelines to avoid damaging switch components:

- Always use a static-free work station with a pad of conductive rubber or similar material when handling switch components.
- If a device requires soldering, be sure the assembly is placed on a pad of conductive material. Also, be sure that you, the pad, and the soldering iron tip are grounded to the assembly.

Soldering Printed Circuit Boards

Some of the components on the etched circuit boards in the switch have plated through-holes that allow a solder path to both sides of the insulating material. Soldering can be done from either side of the board with equally good results. When soldering to any circuit board, keep in mind the following guidelines:

- Avoid unnecessary component unsoldering and soldering. Excessive replacement can result in damage to the circuit board and/or adjacent components.
- Do not use a high-power soldering iron on etched circuit boards, as excessive heat may lift a conductor or damage the board.
- Use a suction device or wooden toothpick to remove solder from component mounting holes. When using a suction device, be sure that the equipment is properly grounded.

Post-Repair Safety Checks

After making repairs to the E1364A Switch Module, inspect the switch for any signs of abnormal internally generated heat, such as discolored printed circuit boards or components, damaged insulation, or evidence of arcing. Determine and correct the cause of the condition. Then perform the Functional Verification Test described in Chapter 2 to verify that the switch is functional.

Appendix A
Verification Tests - C Programs

Functional Verification Test

This program is designed to do the Functional Verification Test found in Chapter 2, "Verification Tests."

Example

This example sends a *IDN? command to the switch. This test can be used to verify that the switch is connected properly and is responding to a basic command.

```
#include <stdio.h>
#include <sicl.h>

#define ADDR "hpib7,9,15"          /* Address of device */

main ()
{
  INST id;                         /* Define id as an instrument */
  char a[256] = {0};               /* Result variable */

  id = iopen (ADDR);               /* Open instrument session */

  ipromptf(id, "*IDN?\n", "%t", a); /* Self test command */
  printf("\n %s", a);              /* Print result */
  getchar();                       /* Pause */

  iclose (id);                     /* Close instrument session */
}
```

Performance Verification Tests

These programs are designed to do the Performance Verification Tests found in Chapter 2, "Verification Tests."

Example: Closed Channel Resistance Test

This example performs the Closed-Channel Resistance Test for all Normally Open and Normally Closed contacts.

```
/*  Closed-channel Resistance Test          E1364A  */

#include <stdio.h>
#include <sicl.h>

#define ADDR "hpib7,9,15"                   /* Address of device */
#define DMM "hpib7,22"

void main (void)
{
  INST id, dm;                    /* Define id and dm as an instrument */
  char reading[256] = {0};                  /* Result variable */
  int channel, i;

  #if defined(__BORLANDC__) && !defined(__WIN32__)
   _InitEasyWin();
  #endif

  ionerror(I_ERROR_EXIT);

  id = iopen (ADDR);                        /* Open instrument session */
  dm = iopen (DMM);

  iprintf (id, "*RST\n");
  iprintf (dm, "PRESET NORM;TRIG HOLD\n");
  iprintf (dm, "FUNC OHMF\n");

  printf ("\n\nConnect DMM to NO and C lines of E1364A (4-wire
           connection)");
  getchar ();
  printf ("\n\nContact Resistance -- Normally open contacts\n");

  for (i = 0; i <= 15; i++)
  {
    channel = 100 + i;
```

```
    iprintf (id, "CLOS (@%u)\n", channel);
    ipromptf (dm, "TRIG SGL\n", "%t", reading);
    printf ("\n Channel %u (closed): %s", i, reading);

    iprintf (id, "OPEN (@%u)\n", channel);
    ipromptf (dm, "TRIG SGL\n", "%t", reading);
    printf ("\n Channel %u (open):   %s", i, reading);
  }

  printf ("\n\nConnect DMM to NC and C lines of E1364A (4-wire
           connection)");
  getchar ();
  iprintf (id, "CLOS (@100:115)\n");
  printf ("\n\nContact Resistance -- Normally closed contacts\n");

  for (i = 0; i <=15; i++)
  {
    channel = 100 + i;

    iprintf (id, "OPEN (@%u)\n", channel);
    ipromptf (dm, "TRIG SGL\n", "%t", reading);
    printf ("\n Channel %u (closed): %s", i, reading);

    iprintf (id, "CLOS (@%u)\n", channel);
    ipromptf (dm, "TRIG SGL\n", "%t", reading);
    printf ("\n Channel %u (open):   %s", i, reading);
  }

  iclose (id);iclose (dm);                    /* Close instrument session */
}
```

Example: DC Isolation Test

This example performs the DC Isolation Test for Normally Open and Normally Closed channels to both Common and chassis (earth ground).

```
/*  DC Isolation Test          E1364A  */

#include <stdio.h>
#include <sicl.h>

#define ADDR "hpib7,9,15"                    /* Address of device */
#define DMM "hpib7,22"

void main (void)
{
  INST id, dm;                    /* Define id and dm as an instrument */
  char reading[256] = {0};                    /* Result variable */
  int channel, i;

  #if defined(__BORLANDC__) && !defined(__WIN32__)
   _InitEasyWin();
  #endif

  ionerror(I_ERROR_EXIT);

  id = iopen (ADDR);                          /* Open instrument session */
  dm = iopen (DMM);

  iprintf (dm, "PRESET NORM;TRIG HOLD\n");
  iprintf (dm, "FUNC OHM;RANGE 1E9\n");

  printf ("\n\nConnect DMM HI and LO to E1364A NO and C lines");
  getchar ();
  iprintf (id, "*RST\n");
  ipromptf (id, "*OPC?\n", "%t", reading);
  ipromptf (dm, "TRIG SGL\n", "%t", reading);
  printf ("\nDC Isolation -- Normally Open Channels to Common");
  printf ("\n  R = %s", reading);

  printf ("\n\nConnect DMM HI and LO to E1364A NC and C lines");
  getchar ();
  iprintf (id, "CLOS (@100:115)\n");
  ipromptf (id, "*OPC?\n", "%t", reading);
  ipromptf (dm, "TRIG:SGL\n", "%t", reading);
  printf ("\nDC Isolation -- Normally Closed Channels to Common");
  printf ("\n  R = %s", reading);
```

```
  printf ("\n\nConnect DMM HI and LO to E1364A NO line and
           mainframe chassis");
  getchar ();
  ipromptf (dm, "TRIG SGL\n", "%t", reading);
  printf ("\nDC Isolation -- Normally Open Channels to Chassis");
  printf ("\n  R = %s", reading);

  printf ("\n\nConnect DMM HI and LO to E1364A NC line and
           mainframe chassis");
  getchar ();
  iprintf (id, "OPEN (@100:115)\n");
  ipromptf (id, "*OPC?\n", "%t", reading);
  ipromptf (dm, "TRIG SGL\n", "%t", reading);
  printf ("\nDC Isolation -- Normally Closed Channels to Chassis");
  printf ("\n  R = %s", reading);

  iclose (id);                                  /* Close instrument session */
  iclose (dm);
}
```

Appendix B
Backdating Information

Introduction

This chapter contains information for ordering replaceable parts for the Agilent E1364A Switch Modules with serial numbers prior to 2934A10370.

- Table B-1 lists the assembly and terminal module part numbers for the E1364A Switch Module.
- Table B-2 lists the Reference Designators for the switch module.

Ordering Information

To order a part listed in Table B-1, specify the Agilent part number and the quantity required. Send the order to your nearest Agilent Technologies Sales and Support Office.

If your E1364A Switch Module has a serial number of 2934A10370 and higher, refer to Chapter 3 for replaceable parts ordering information.

Replaceable Parts List

See Figures B-1 and B-2 or the Component Locator (in the back of this manual) for locations of replaceable parts.

Table B-1. Agilent E1364A Replaceable Parts

Reference Designator	Part Number	Qty	Part Description
	E1364-66201	**1**	**COMPONENT ASSEMBLY**
			PRIMARY COMPONENTS
BRK1-BRK2	0050-2183	2	CASTING-ZN P.C. BOARD HOLDER
F1	2110-0712	1	FUSE- SUBMINIATURE 4A 125V NTD AX
F2	2110-0665	1	FUSE- SUBMINIATURE 1A 125V NTD AX UL CSA
J1	1252-1591	1	CONNECTOR-POST TYPE 5.08-PIN-SPCG 48-CONTACT
K0-K15	0490-1651	16	RELAY 2C 12VDC-COIL 3A 220VDC
LBL1	E1300-84308	1	LBL LOGO B SIZE
LBL2	E1300-84312	1	LBL-LOGO VXI B SIZE
MP1-2	1400-1546	2	BRACKET PC BOARD HOLDER; BLACK; EXTRUDED
P1	1252-1596	1	CONNECTOR-POST TYPE 2.54-PIN-SPCG 96-CONTACT
SCR1-2	0515-0444	2	SCREW- X 8MM-LG -HD
SCR3-4	0515-1968	2	SCR PHM 2.5 X 11 TX
SHD1	E1300-80601	1	SHIELD SAFETY
SW1	3101-3066	1	SWITCH-DIP ROCKER 8-1A 0.15A 30VDC

Reference Designator	Part Number	Qty	Part Description
			ADDITIONAL COMPONENTS
	3050-0082	2	WASHER-FL NM NO. 4 .116-IN-ID .188-IN-OD
C1	0180-3899	1	CAPACITOR-FXD 220uF +-20% 50 V AL-ELCTLT
C2	0160-3334	2	CAPACITOR-FXD 0.01uF +-10% 50 V CER X7R
C9	0160-4801	1	CAPACITOR-FXD 100pF +-5% 100 V CER C0G
C11	0160-3334		CAPACITOR-FXD 0.01uF +-10% 50 V CER X7R
C17	0160-4835	10	CAPACITOR-FXD 0.1uF +-10% 50 V CER X7R
C38-C42	0160-4835		CAPACITOR-FXD 0.1uF +-10% 50 V CER X7R
C44	0180-1746	1	CAPACITOR-FXD 15uF +-10% 20 V TA
C45-C48	0160-4835		CAPACITOR-FXD 0.1uF +-10% 50 V CER X7R
CR1	1902-0557	1	DIODE-ZENER 24V 5% PD=1W IR=5UA
CR2	1901-1098	1	DIODE-SWITCHING 1N4150 50V 200MA 4NS
JM15-JM16	7175-0057	2	RESISTOR 0 MFS
LBL1	7121-7148	1	LABEL-INFORMATION .25-IN-WD .9-IN-LG
LBL2	9320-5333	1	LBL-LNE-PTR; .625-IN-WD X .25-IN-LG
PNL1	E1364-00202	1	PNL-RR RLY MUXR
R1	0757-0465	1	RESISTOR 100K +-1% .125W TF TC=0+-100
R2	0757-0453	1	RESISTOR 30.1K +-1% .125W TF TC=0+-100
R9	0757-0417	1	RESISTOR 562 +-1% .125W TF TC=0+-100
R10	0698-3451	1	RESISTOR 133K +-1% .125W TF TC=0+-100
RP1-RP4	1810-0265	4	NETWORK-RES 16-DIP 680.0 OHM X 8
RP25-RP26	1810-0279	3	NETWORK-RES 10-SIP 4.7K OHM X 9
RP32	1810-0279		NETWORK-RES 10-SIP 4.7K OHM X 9
RVT1-RVT2	0361-1231	2	RIVET-SEMITUB OVH .099DIA .36LG
RVT3-RVT4	0361-1294	2	RIVET-SEMITUB OVH .099DIA .328LG
RVT5-RVT6	0361-1295	2	RIVET-SEMITUB OVH .095DIA .406LG
U1-U4	1858-0069	4	TRANSISTOR ARRAY 18-PIN PLASTIC DIP
U5	1820-4057	1	IC BUFFER TTL/F NAND QUAD 2-INP
U6	1820-6731	1	IC GATE-ARRAY CMOS
U7-U8	1820-3079	2	IC DCDR CMOS/74HC BIN 3-TO-8-LINE
U9	1820-3081	1	IC FF CMOS/74HC D-TYPE POS-EDGE-TRIG
U10-U11	1820-3975	2	IC DRIVER CMOS/74HC LINE OCTL
U12	1820-4590	1	IC MV CMOS/74HC MONOSTBL RETRIG DUAL
U15	1820-4147	1	IC LCH CMOS/74HCT TRANSPARENT OCTL
U16	1820-3714	2	IC TRANSCEIVER TTL/ALS BUS OCTL
U17-U18	1820-3631	2	IC COMPARATOR CMOS/74HCT MAGTD 8-BIT
U19	1820-3664	1	IC GATE CMOS/HCT NAND QUAD 2-INP
U20	1820-4242	1	IC SCHMITT-TRIG CMOS/74HCT INV HEX
U21-U22	1820-4643	2	IC GATE CMOS/74HCT NOR QUAD 2-INP

Reference Designator	Part Number	Qty	Part Description
U25-U26	1820-5424	2	IC DRIVER CMOS/74HCT LINE OCTL
U30	1820-4152	2	IC FF CMOS/74HCT D-TYPE POS-EDGE-TRIG
U35	1820-3714		IC TRANSCEIVER TTL/ALS BUS OCTL
U38	1820-4152		IC FF CMOS/74HCT D-TYPE POS-EDGE-TRIG
	E1364-80001	1	**E1364A TERMINAL MODULE**
	E1364-66510	1	TERMINAL CARD 16-CH GP RLY SWITCH
	E1300-84401	1	TERMINAL CARD, CASE ASSEMBLY

Table 3-2. E1364A Reference Designators

Agilent E1364A Reference Designators			
A	assembly	P	electrical connector (plug)
BRK	bracket	PCB	printed circuit board
C	capacitor	PNL	panel
CR	diode	R	resistor
LBL	label	RP	resistor pack
F	fuse	RVT	rivet
J	electrical connector (jack)	SCR	screw
JM	jumper	SHD	shield
K	relay	SW	switch
LBL	label	TB	terminal block
MP	mechanical part	U	integrated circuit

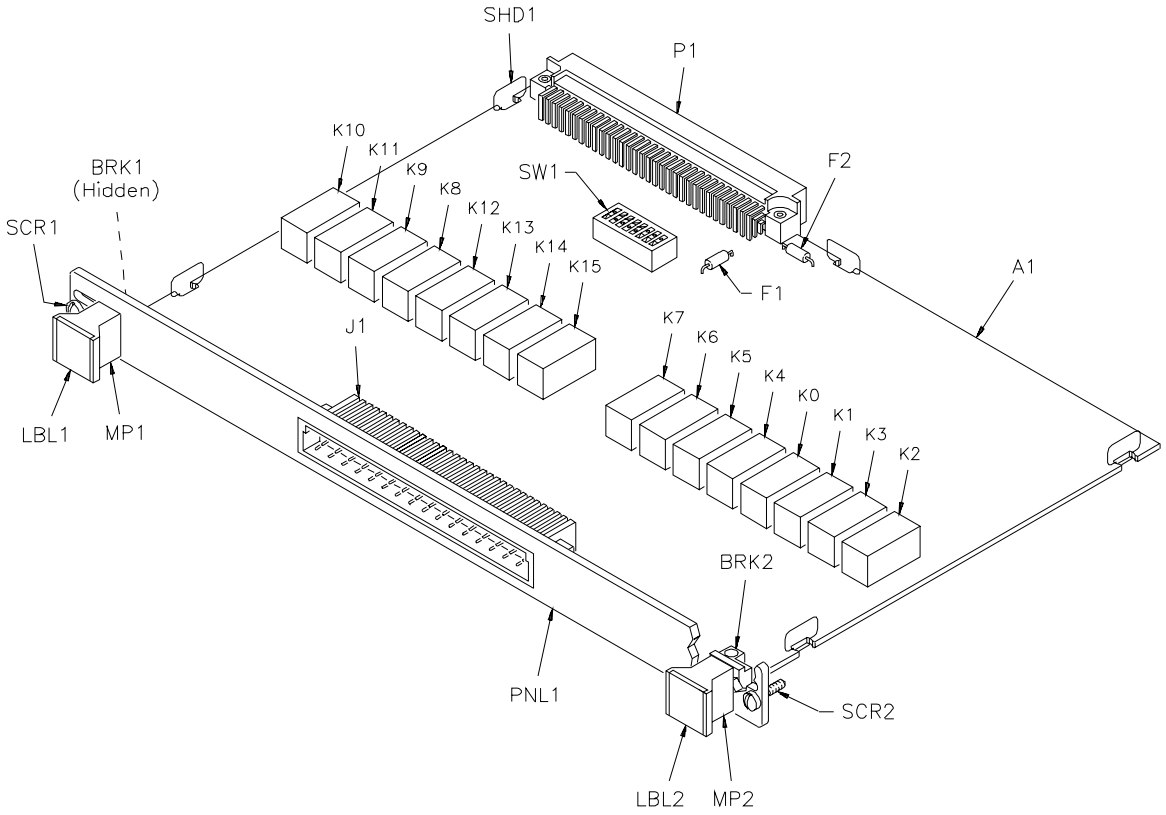


Figure B-1. E1364A Component Assembly Parts

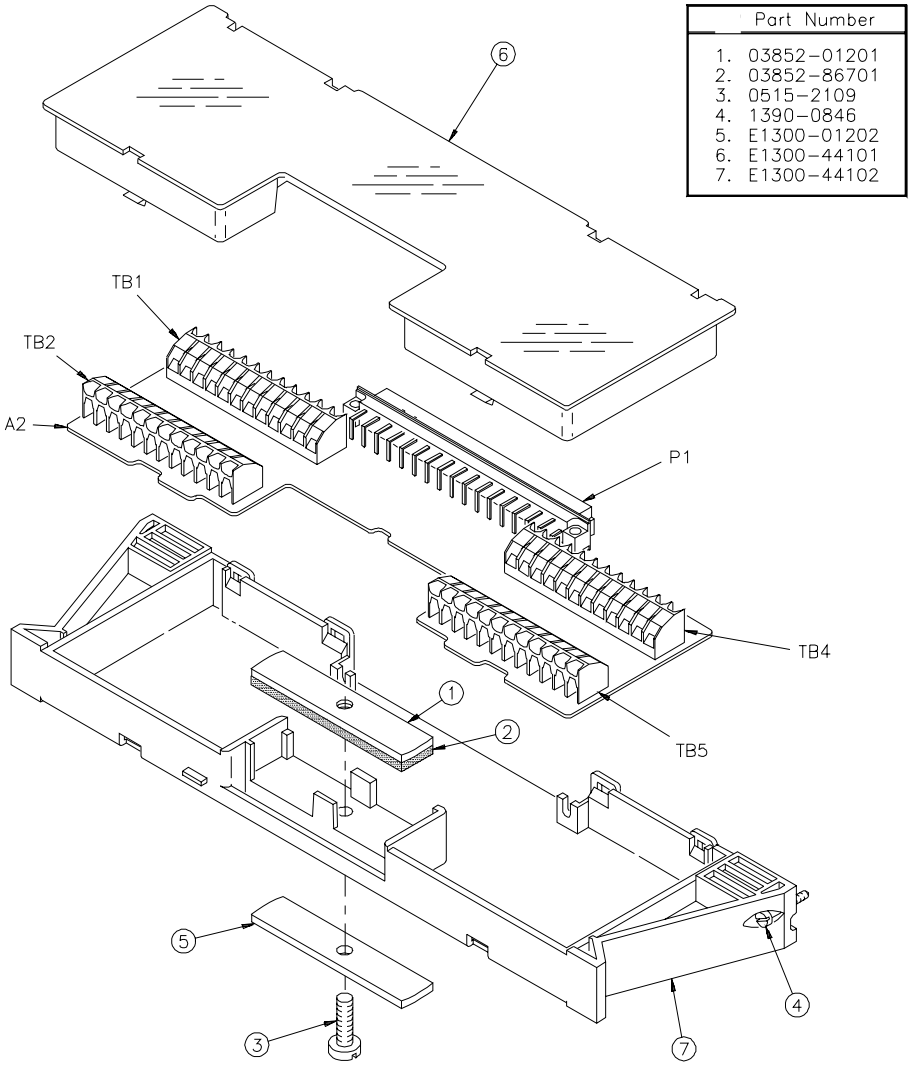


Figure B-2. E1364A Terminal Module Replaceable Parts

Agilent Technologies

Copyright © Agilent Technologies, Inc. 1991-2005